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Origin of magnetoelectric response induced by respective magnetic ions R^{3+}/Fe^{3+} in a chiral antiferromagnet $R\mathbf{Fe_3(BO_3)_4}$[1] TAKASHI KURUMAJI, Department of Applied Physics and Quantum-Phase Electronics Center (QPEC), Univ. Tokyo, KENYA OHGUSHI, Institute for Solid State Physics, Univ. Tokyo, YOSHINORI TOKURA[2], RIKEN Center for Emergent Matter Science (CEMS) — Recent discoveries of the spin-induced ferroelectricity in frustrated magnets and the strong ME correlation in noncentrosymmetric magnets have stimulated the revived interest on the ME phenomena [1]. Rare earth iron borates $R\mathrm{Fe_3(BO_3)_4}$, whose structures possess a noncentrosymmetric space group ($R32$ or $P3_121$), have recently been discovered to show multiferroicity [2]. While their magnetic and ME properties were extensively investigated, the origin of the P, or specifically the relationship between the electricity and the respective magnetism of iron ions (Fe) and rare-earth ions (R), remains elusive. We measured the P under a magnetic field and observed the linear ME effect and/or the spontaneous P which are ascribed to spins of Fe and/or magnetic moments of R. We constructed a model for the spin-induced P at the Fe/R sites, with which we could reproduce the observed behavior of the magnetic field dependence of P. Thus, we could extract the respective contributions to P from Fe and R magnetic ions.

[1] T. Arima, J. Phys. Soc. Jpn. 80 (2011) 052001
[2] A. M. Kadomtseva et al. Low Temp. Phys. 36 (2010) 511

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[2]Also at Department of Applied Physics and Quantum-Phase Electronics Center (QPEC), Univ. Tokyo

Takashi Kurumaji
Department of Applied Physics and Quantum-Phase
Electronics Center (QPEC), University of Tokyo

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